

VOLUME 4 NUMBER 2

APRIL 1987

THANKS FOR YOUR SUPPORT!

We were hoping that you would show your support for ATCO and the ATCO Newsletter, and you did. As we go to press, we have 19 members.

Remember the ATCO Tuesday Night Net, it meets at 8 p.m. EST and 9 p.m. EDST - tune in and enjoy ATV.

HERE'S WHAT'S INSIDE

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The ATCO Newsletter is the official publication of a group of television amateurs known as "AMATEUR TELEVISION IN CENTRAL OHIO" and is published in January, April, July, and October.

Membership in ATCO is open to any FCC licensed radio amateur who has an interest in amateur television.

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CERTIFICATE OF APPRECIATION

Recently, ATCO presented a "Certificate of Appreciation" to Bill, W8DMR, for his outstanding service to ATCO, and the unselfish giving of his time and technical assistance to the amateur television operators in Central Ohio.

Some of us who are not electronic brains (I'm one of 'em - Ed.) rely on Bill's expertise to keep our stations operating efficiently. Bill has already contributed several articles which have been published in the ATCO Newsletter, and more are on the way.

WE ARE ATCO!

Thought you might like a little information about our members. From the membership application forms you sent in, we were able to come up with the following:

1. As of 31 March, 19 ATVers have joined ATCO.
2. We have five Techs, one General, twelve Advanced, and one Extra.
3. Six of us are retired.
4. Fifteen of us reside in Franklin County. Clark County, Madison County, and Montgomery County each claim one member, and we have a member living in Florida.
5. Members' ham interests include fast scan TV, slow scan TV, RTTY, low band, 2 meters, 440 FM, packet, DX, tinkering, microwave, operation of ATV repeater, improving station performance and quality, and as one member said, "All of it."
6. Ten ATV operators volunteered to manage the ATCO Tuesday Night Net twice each year.
7. As for submitting articles for the ATCO Newsletter, eleven of us answered affirmatively.

A FEW WORDS FROM FLORIDA

Ira, KBHRR, is our "Sunshine State" member. He writes, "Just heard a couple of guys on the Island [Merritt Island] here are toying with it [ATV]! I'll have to get my stuff out I guess." We hope Ira will keep us advised about his Florida ATV activities.

W8DMR ATV P-UNIT METER

To aid in giving P-reports and pointing antennas, a meter similar to the conventional S-meter is needed by ATV operators. A P-unit is a picture unit which describes the quality of TV reception. P-zero (P-0) is the lowest report with P-5 being the highest report given for a received video picture. A P-unit is approximately a 7 dB signal increase. P-0 is 7 dB above the noise floor of the TV receiving system, and P-5 is 42 dB above.

A voltage proportional to the incoming signal strength is provided by the TV receiver AGC line. This voltage varies typically from +8 to +2 volts dc. The voltage decreases with the increasing signal strength. The AGC signal connection is made on the VHF tuner AGC terminal and does not affect the operation of the TV receiver.

The circuit shown below uses a 741 IC op amp connected as a voltage follower in a modified bridge configuration. Null and gain adjustments are provided to null out the AGC voltage offset and to set the AGC voltage change for a full-scale calibration. The meter face scale shows how the P-unit markings may be added. A scale compression circuit permits linear P-readings and limits the higher scale readings from strong local UHF TV stations. (Prepared and submitted by W8DMR)

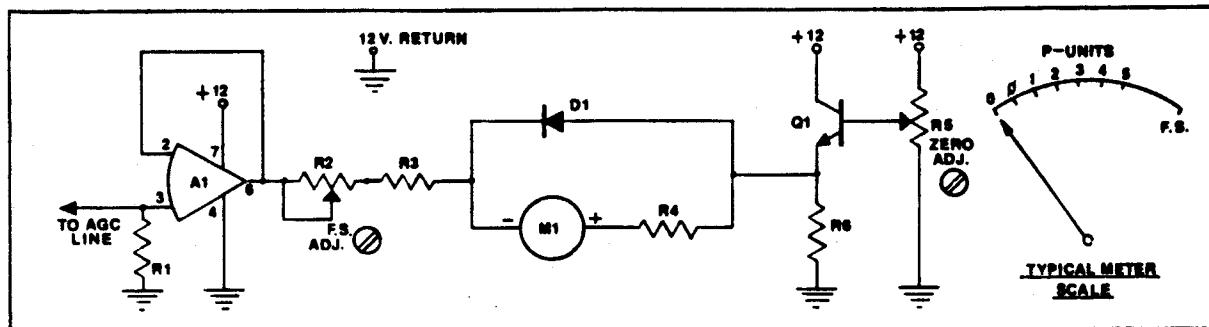


Fig 1-SCHEMATIC DIAGRAM OF THE W8DMR P-UNIT METER

| | | | |
|----|-------------------------|--------------------|-------------|
| R1 | - 220 k ohm, 1/4 watt | DC RETURN RESISTOR | RS-271-059 |
| R2 | - 25 k ohm, pot | GAIN ADJUSTMENT | RS-271-336 |
| R3 | - 1.0 k ohm, 1/4 watt | CURRENT LIMITER | RS-271-1321 |
| R4 | - 3.3 k ohm, 1/4 watt | SCALE COMPRESSOR | RS-271-1328 |
| R5 | - 10 k ohm, pot | ZERO ADJUSTMENT | RS-271-335 |
| R6 | - 10 k ohm, 1/4 watt | EMITTER LOAD | RS-271-1335 |
| D1 | - 1N34A, diode, ger. | SCALE COMPRESSOR | RS-276-1123 |
| Q1 | - 2N3904, trans., NPN | REG. REF SOURCE | RS-276-1603 |
| A1 | - 741 op amp, 8 pin dip | VOLTAGE FOLLOWER | RS-276-007 |
| M1 | - 100 uA meter | P-METER | YOUR CHOICE |
| S1 | - 8 pin dip socket | RECOMMENDED | RS-276-1995 |
| B1 | - pre-drilled PC board | PARTS MOUNTING | RS-276-148 |

THE COLOR TV SIGNAL

In order to provide compatibility, the complete color signal must contain a black and white signal in the conventional form. In other words, existing black and white receivers must be able to reproduce monochrome pictures with no changes required in their circuitry. For this purpose, the complete color signal contains a monochrome or y -signal. The additional color information is added in such a way that black and white receivers ignore the chromaticity information. Color receivers are designed to detect the chromaticity information and reconstruct the original primary-color information.

Due to the peculiarities of the human eye, it was found equal amounts of red, blue, and green would not produce white. Based on experimental findings using the selected red, green, and blue primaries, a correct monochrome picture is produced by adding together 30% of the camera's red one volt output, 59% of the green output, and 11% of the blue output. The sum of these signals is called the brightness or luminance signal and is designated by the letter y . The y -signal is similar to the signal produced by the black and white camera.

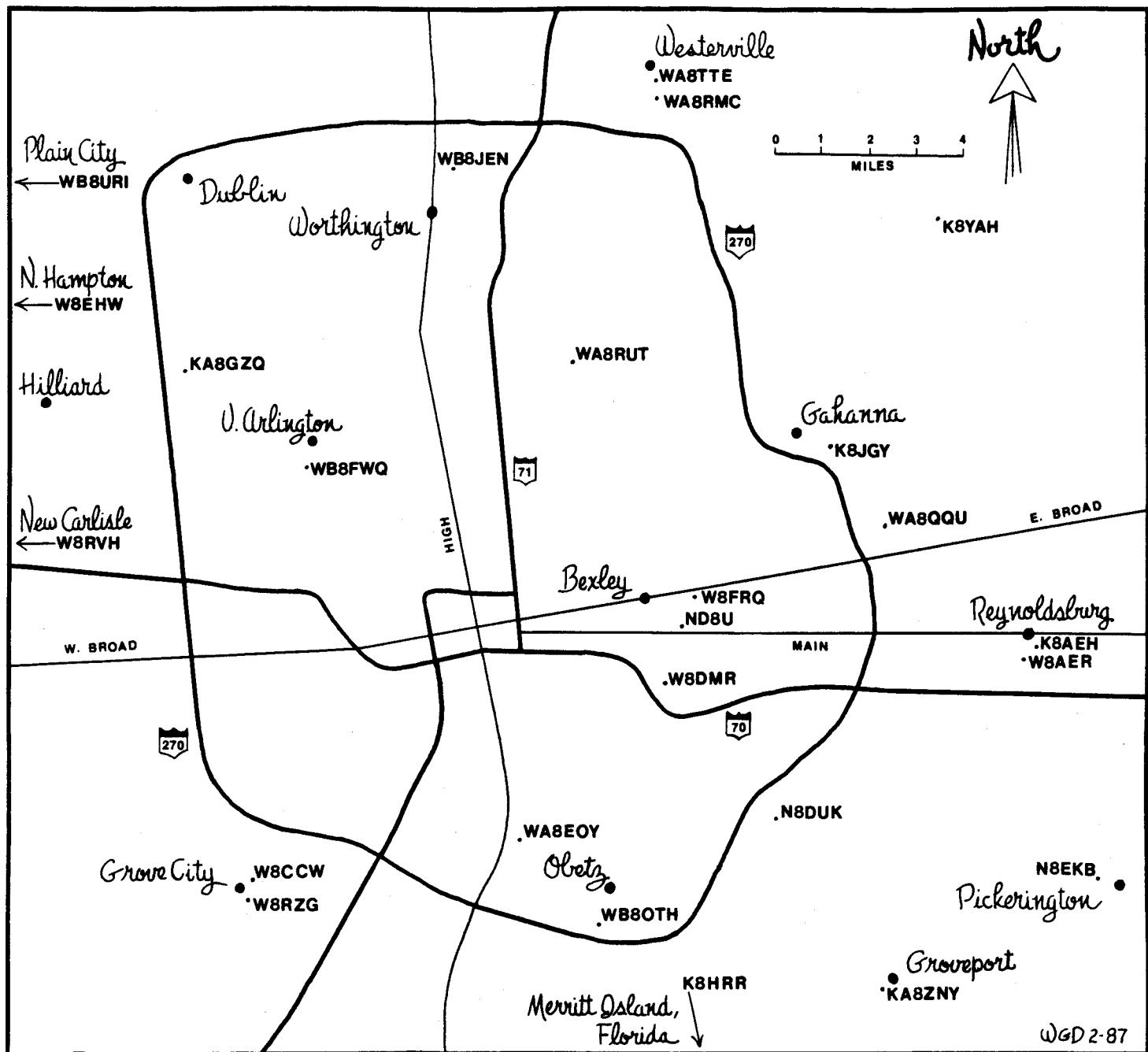
Therefore, $y = 30\% \text{ red} + 59\% \text{ green} + 11\% \text{ blue}$.

Frequency interlace. The subcarrier frequency is synchronized with the horizontal line frequency in a way that minimizes the visibility of the beat pattern on the picture tube. Visual cancellation of the beat pattern takes place when the bright spots caused by the positive excursions of the subcarrier signal are interleaved on alternate scanning lines as shown in Fig 1a. Here we see sections of the waveform for two consecutive horizontal lines. In the top line, the subcarrier starts on a positive half-cycle. On the next line (one frame later), the subcarrier signal begins with a negative half-cycle. The beat pattern appears as in Fig 1b. If we pick any small area of the picture, we might see a bright spot on one line, and one frame later will display a darkened spot. Persistence of vision causes an averaging of visual sensation, and we see an average light level. The average light level is determined by the amplitude of the y -signal upon which the subcarrier rides. In addition, the lines of the beat pattern are at a 45 degree angle with the horizontal. Visual acuity is poorest when fine lines are set at a 45 degree angle with the horizontal.

The visual cancellation shown in Fig 1a occurs when the subcarrier frequency is made an odd multiple of one half the horizontal line frequency. Alternate scanning lines then present the pattern shown in Fig 1b because the time interval that elapses between the instant any spot is scanned on alternate frames allows the completion of an even number of subcarrier

(continued on page 8)

ATV STATION MAP



HISTORY LESSON

Nineteen twenty-seven was the year Philo Farnsworth took a patent on an electronic TV system, and Bell Labs transmitted pictures on the air. During the same year, the first coast-to-coast radio broadcasting network was inaugurated.

THE DAYTON ATV REPEATER

The Dayton Amateur Radio Association (DARA) ATV Repeater, located 10 miles south of Dayton, has an output of 20 watts average on 426.250 MHz video and a 430.750 MHz audio subcarrier. At a ground elevation of 1020 feet MSL, the receiving antenna is at the 140 foot level, and the transmitting antenna is at the 90 foot level on the supporting tower.

With a 45 mile coverage, the repeater's main input is on 439.250 MHz video, and it accepts on-carrier audio. The antennas are fed with 1/2 inch heliax.

A 2-meter carrier input on 147.450 MHz brings the ATV Repeater identification on for 20 seconds. Dropping the 2-meter carrier causes the video ID to reverse polarity. A second input on 1245.0 MHz accepts video and audio signals. The 1245.0 MHz receiver is selectable by a Touch-tone signal via the 2-meter input. Table 1 lists the USER functions available on the DARA ATV Repeater.

Table 1
DARA ATV Repeater Touch-tone USER Functions

| T-TONE | FUNCTION | DESCRIPTION |
|--------|-------------------|----------------------------------|
| Ø | Receiver On | Turns Off ID, Outputs Receiver |
| # | Latch ID On | ID Request Stays on 3 Minutes |
| * | Reset | Resets All USER Functions |
| 5 | WX Radar Video | 5 Second Tone on 1245.0 MHz |
| 56 | Turns On Repeater | 1 Second Each Tone on 1245.0 MHz |

NOTE: 439.250 MHz frequency accuracy must be +15 or -15 kHz.
Both # and Ø are needed to hold ID off 3 minutes.

The repeater control operator has the capability to turn off the transmitter, to turn off the receivers one at a time, and to disable the time-out timer for sending video tapes, etc. The frequency of the 1245.0 MHz receiver may be tuned remotely to correct for drift due to temperature changes. The 1245.0 MHz receiver may be switched to antennas of different polarization.

Inability to transmit received signals at even near the same contrast level as the ID is the repeater's main fault.

Bruce, WB8UGV, of Centerville, Ohio, maintains the DARA ATV Repeater, and he has plans to increase repeater power output to 200 watts during 1987. His phonetics are "Unusually Good Video!"
(Prepared and submitted by W8DMR)

UHF-GATED NOISE SOURCE

If you have ever wondered if your ATV receiver setup was working as hot as usual, or thought things might need a little realignment, then remembered you didn't have a UHF signal generator, read on.

One area that always seems to trip up amateurs is that irresistible temptation to "tweak-up" the front end of a receiver or preamp to make sure it is performing at its maximum. Almost without exception, the well-meaning ham peaks for maximum signal strength and ends up actually degrading performance. The amateur has peaked for maximum sensitivity.

Sensitivity is really a measurement of gain. With modern electronics, gain is easy to achieve throughout the receiver. In television, we have gain in the stages of video, i-f amplifiers, rf amplifiers, and even in some types of detector stages. We have more gain than we ever need. You can prove this by tuning in a snowy TV signal and still be able to turn up the contrast control (video gain) to the point of excess contrast (all whites and blacks, no grays).

Since we have all of this gain, what we need to do is lower the amount of noise (snow) on the initial received signal. We accomplish this by using gain antennas and low loss feedlines to bring the signal to noise ratio to its best level by the time it reaches the antenna connector on our receiver.

Keep in mind that when electronic circuits operate they generate their own random noise. (Read the next sentence very carefully; if you understand it, then you will have accomplished a feat only to be rivaled by an understanding of what SWR really means.) If we have a 10dB signal at the antenna terminal, and our first stage of amplification has self-generated operating noise level of 10dB (noise figure), we aren't going to see anything, no matter how much gain our first stage has!

If we lower the noise figure to 3dB, we now have 7dB of signal over noise for our gain stages to work with. There are many ways to accomplish this improvement, but you must be able to evaluate improvements in noise figure, not gain, to make such improvements.

Signal generators are mainly used to check for proper frequency and sensitivity. A diode noise generator is used to evaluate relative noise figure.

Described here is a simple piece of test equipment that will allow you to adjust preamps and front ends for best noise figure simply and quickly. This is an easy to build project and should be easy to troubleshoot if any initial problems occur.

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THE COLOR TV SIGNAL

(continued from page 4)

hertz plus one half hertz. Thus at any particular spot, successive scans cause a reversal in the instantaneous polarity of the subcarrier signal. To meet the requirements of this technique called frequency interlacing, the subcarrier frequency is set at exactly 3.579545 MHz. A small change in the horizontal line frequency to 15,734.264 Hz is also required as well as a small change in the frame frequency to 59.94 Hz. These frequencies fall within the tolerances of the black and white system. The mathematical calculations on the derivation of the above values are available for those interested. (Prepared and submitted by Bill, WBFRQ)

INTERLACE TECHNIQUE

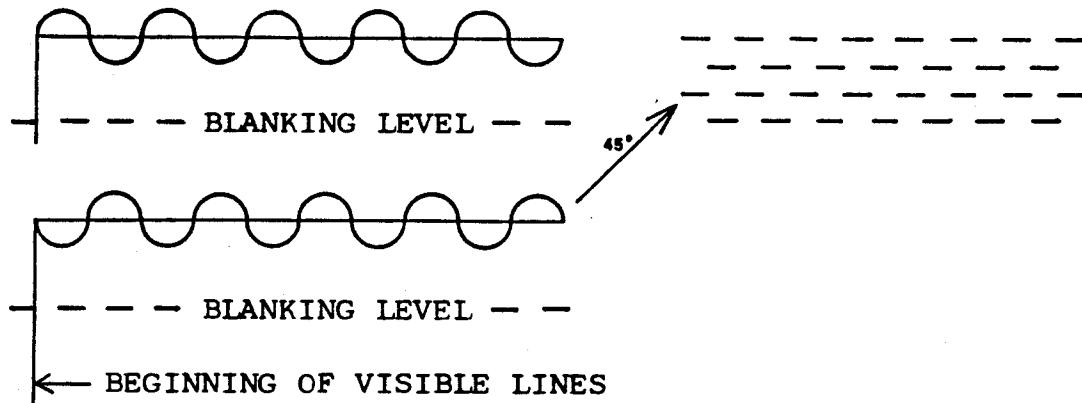


Fig 1a-The subcarrier-
signal is synchronized
with the scanning rate
so that peaks and
valleys are lined up on
adjacent scanning lines.

Fig 1b-The dot pat-
tern resulting from
the frequency inter-
lace technique.

SOLUTION TO JANUARY ARITHMETICKER

The ratio of the slow clock to correct time is 50/60 or 5/6. For each five minutes the slow clock ran, six minutes of correct time elapsed. The slow clock ran 180 slow minutes; therefore, $180/5 \times 6 = 216$ minutes of correct time. WBFRQ's transmitter was on the air for 3 hours and 36 minutes.

NEWS DEADLINE FOR JULY ISSUE OF ATCO NEWSLETTER IS 15 JUNE 1987!!

ATCO FINANCIAL STATEMENT

RECEIPTS:

| | |
|------------------------------------|----------|
| Balance as of 23 October 1986..... | \$ 72.01 |
| Dues*..... | 180.00 |
| | ----- |
| Total..... | \$252.01 |

EXPENDITURES:

| | |
|--|----------|
| 100 postage stamps @.22 each..... | \$ 22.00 |
| Mailing labels..... | 5.23 |
| Printing charges for January 1987 ATCO Newsletter..... | 18.47 |
| Misc. costs incidental to preparation of newsletter.. | 21.07 |
| | ----- |
| Total..... | \$ 66.77 |

SUMMARY:

| | |
|----------------------------------|----------|
| Receipts..... | \$252.01 |
| Expenditures..... | 66.77 |
| | ----- |
| Balance as of 31 March 1987..... | \$185.24 |

POSTAGE STAMP INVENTORY:

| | |
|---|-----|
| Stamps purchased 24 October 1986..... | 100 |
| Stamps used..... | 47 |
| | --- |
| Stamps on hand as of 31 March 1987..... | 53 |

*Note: One member paid dues prior to 23 October 1986 and just before suspension of ATCO activity.

The above financial report was prepared as of 31 March 1987 by Warren G. Duemmel, KA8GZQ, Acting ATCO Treasurer.

ARITHMETICKER

A 12 inch wide TV picture tube beam draws 525 lines on its screen for a complete picture. Have you ever considered how fast that beam travels in miles per hour? Is one of the values below correct?

A. 15750 B. 31500 C. 10739 D. 3579

The answer will be published in the July ATCO Newsletter.

UHF-GATED NOISE SOURCE

(continued from page 7)

From an electronic standpoint, the device functions in three sections. Section one is a 555 astable multivibrator operating at approximately 700 Hz per second. The square wave output is fed to section two which is a 10k pot used as a voltage divider. This square wave voltage is then fed to section three which is the actual noise generator. The result is a broad band of noise that is easily recognized on your TV screen as white and dark bands of changing noise levels created as the square wave turns the diode noise generator on and off at a 700 Hz rate.

As the front end under test is adjusted for a larger contrast between the bands of noise, the pot is adjusted to lower the amplitude of the square wave thus lowering the output of noise so that further adjustment may be attempted. When no further improvement is possible, you have successfully aligned the stage for best possible noise figure. Remember, this is not necessarily the most gain possible from this stage, but we don't need gain here, we can get that in later stages.

While this instrument doesn't provide a calibrated noise figure, we can label the adjusting pot with divisions so that it is possible to compare the initial level of noise against the final level to determine if any improvement was achieved. Also, if this level is recorded, and a new battery is used in a later test to insure calibration, it will be possible to determine if any change has occurred in the system. This can be especially helpful if you suspect any change in performance of your receive system.

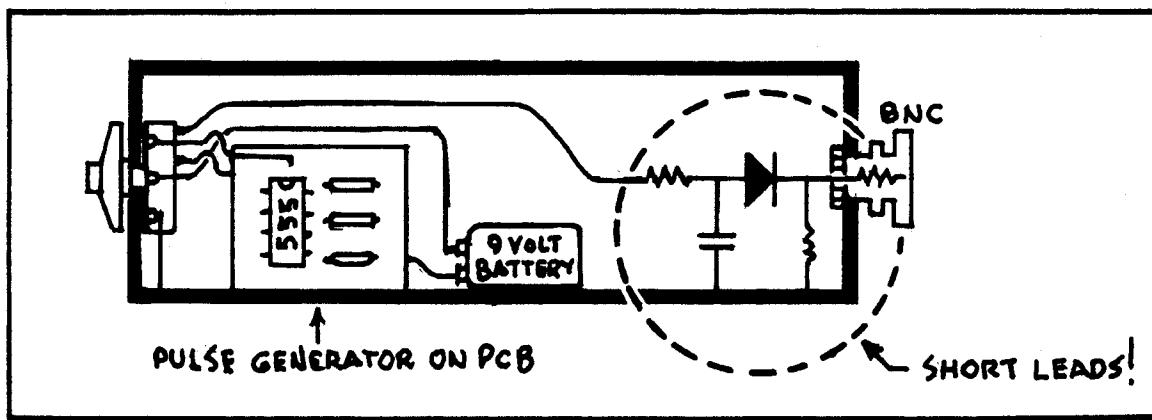


Fig 1-PARTS LAYOUT FOR THE UHF-GATED NOISE SOURCE

The only place lead length is critical is at the diode. The leads here must be as short as possible in order for the device to function at 439.25 MHz. Also, the actual diode portion of the circuit should be in an rf tight enclosure.

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UHF-GATED NOISE SOURCE

(continued from page 10)

A four inch length of one inch diameter copper pipe with copper caps at each end was used for this project. A small box fashioned from printed circuit board would work well, too.

The output should go directly to a BNC connector. Take a BNC connector (a used one will work fine) and disassemble and clean it. Drill a hole in the copper end cap or printed circuit board just large enough for the threaded bolt to the BNC connector to fit through. Put the bolt through the hole from the inside and screw on the other section of the connector from the outside. The diode can be soldered to the 51 ohm resistor which in turn is soldered to the center pin and fed into the connector. The other 51 ohm resistor that goes to ground gives support along with the bypass capacitor on the other end which is also soldered to chassis ground. Remember, short leads!

Refer to the accompanying illustration and schematic (Fig 1 and Fig 2) during construction. When using this test equipment, always start with the least amount of signal and increase it just enough to be usable for adjustments.

Since the noise is AM modulated, it will work fine for ATV. Because the noise is being turned on and off at an audible rate, you can hear it in the speaker of an AM receiver. However, if you try to use it with a FM detector or a product detector, the modulation will not be evident on the detected signal. To align these types of equipment, connect a scope to the end off the i-f strip and you will see a nice square wave that can be used for an indicator, or you can build a simple diode detector and feed this output to the audio amplifier stage. (Prepared and submitted by Bob, WB8JEN)

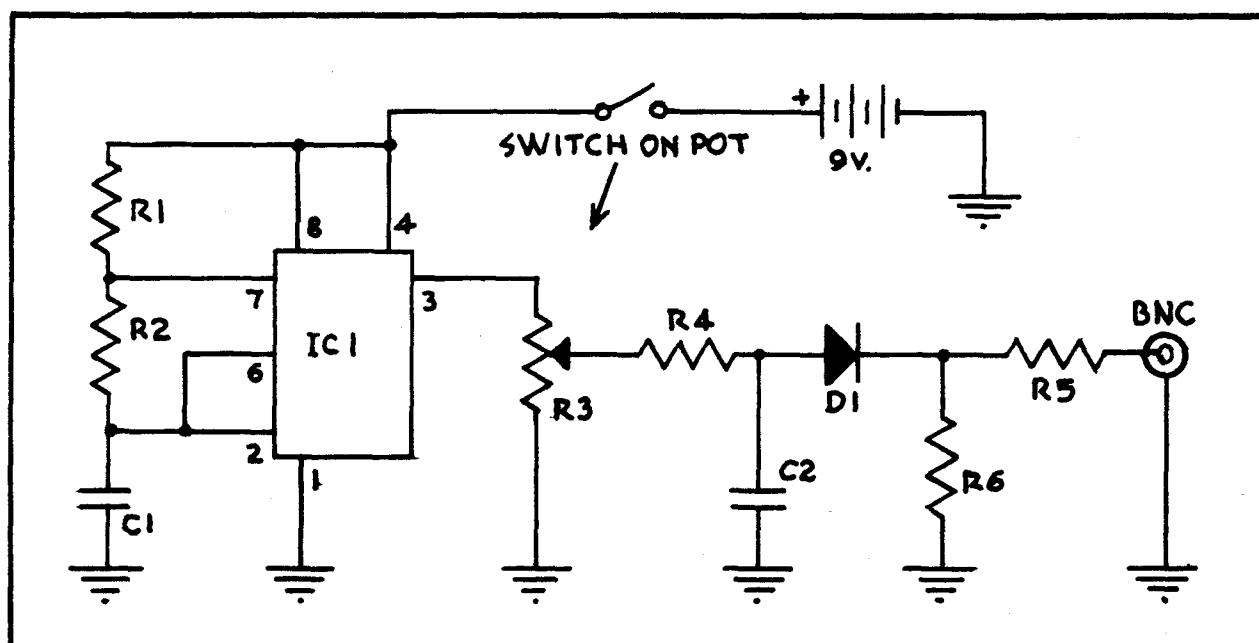


Fig 2-SCHEMATIC DIAGRAM OF THE UHF-GATED NOISE SOURCE

C1 = .1 uF capacitor
C2 = .001 uF capacitor

D1 = 1N21 or 1N23 or equivalent diode*

IC1 = 555 astable multi-vibrator

R1 = 4.7 k ohm resistor

R2 = 15 k ohm resistor
R3 = 10 k ohm linear taper pot with switch

R4 = 270 ohm resistor

R5, R6 = 51 ohm resistors

BNC type connector

*Note: Surplus microwave diode good - not 1N34, etc.

OLD MIKES EVOKE MEMORIES

How many of you remember the Skindervicken button microphone once advertised in Popular Mechanics magazine? Or did you know a workable mike can be made by laying two carbon sticks crisscross on a cigar box?

Dave, W8AER, has a Skindervicken mike! Not only does he have one of those, but he has a collection of 17 others, all different, dating back to about 1925. Dave tried duplicating the original of carbon sticks on a cigar box and found that it actually worked.

Among the mikes in Dave's collection are a Western Electric 600A which was used at WAIU (now WTVN) in the mid-twenties, and a Remmler condenser microphone used by WBNS in 1935. His collection ranges from a F1 telephone mike to those of the home-brew ribbon and condenser variety. Also in his collection, you will find vintage crystal, ceramic, and dynamic microphones.

In his reminiscing about the days of early radio in Columbus, Dave wonders if you remember the two 75 foot towers atop the Seneca Hotel which were for WSEN years ago - do you?

So, if you see someone restoring and polishing old microphones to make them shiny and look like new, it will be Dave.

BROOM HANDLE RHOMBIC

Here's how to make your broom handle rhombic antenna. Salvage four old broom handles and an old video tape and you're ready to construct a 420-450 MHz rhombic antenna. Once constructed as shown in Fig APR1, the antenna is virtually "fool proof." The broom handles are wound closely with the old used video tape which gives the antenna circular polarization and conduction since wood is a fairly good insulator. The engineering marvel of this antenna is the feed point which is composed of two silver teaspoons soldered to the wooden dowels to provide a good match between the antenna and the six ohm coax which insures low SWR.

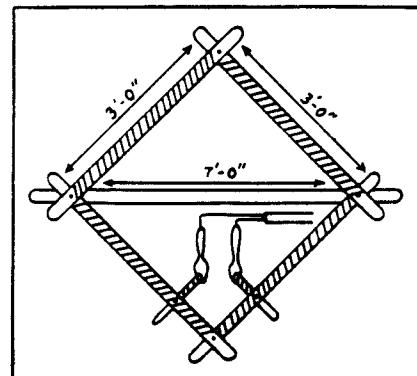


Fig APR1

Since the spreader arm must be a little longer than the two sides, an old rake handle will fill the bill quite nicely and provide a good wave-front capture area. Once construction is completed, a coat of wheel-bearing lubricant will protect this antenna from the elements.

Good luck!

ATCO MEMBERS AS OF 31 MARCH 1987

| | | | |
|--------|---|--------|--|
| K8AEH | Wilbur Wollerman 1672 Rosehill Road Reynoldsburg 43068 | WB8JEN | Bob Mills 6834 Halligan Avenue Worthington 43085 |
| W8AER | David Sears 1678 Kaiser Drive Reynoldsburg 43068 | K8JGY | Fred Yost 330 Dellfield Way Gahanna 43230 |
| WBCCW | John Ferrell 3722 Wagner Court Grove City 43123 | WA8RMC | Arthur Towslee 180 Fairdale Avenue Westerville 43081 |
| WBDMR | William Parker 2738 Floribunda Drive Columbus 43209 | WA8RUT | Ken Morris 3181 Gerbert Road Columbus 43224 |
| N8DUK | Ron Reynolds 4642 Glengate Drive Columbus 43232 | WA8TTE | Phil Morrison 154 Llewellyn Avenue Westerville 43081 |
| W8EHW | Foster Warren 124 East Clark Street North Hampton 45349 | ND8U | Philip Brooks 669 South Kellner Road Columbus 43209 |
| WA8EOY | John Schlaechter 3199 Lewis Road Columbus 43207 | WB8UGV | Bruce Jaquish 193 Cherry Drive Centerville 45459 |
| WBFRQ | William Ennis 146 South Weyant Avenue Columbus 43213 | WB8URI | William Heiden 4435 Kaufman Road Plain City 43064 |
| KA8GZQ | Warren Duemmel 3488 Darbyshire Drive Columbus 43220 | K8YAH | Ronald Vanke 5094 Longrifle Road Westerville 43081 |
| K8HRR | Ira Bickham 260 Tiki Drive Merritt Is., FL 32952 | | |

OUR CONTRIBUTORS

Thanks to the following for contributing to this issue of the ATCO Newsletter:

Dave, W8AER, for telling us about his microphone collection. Read "Old Mikes Evoke Memories."

Bill, WBFRQ, who submitted two articles - "WBFRQ ATV P-Unit Meter" and "The Dayton ATV Repeater."

Bill, WBFRQ, for writing the item on "The Color TV Signal," another "Arithmeticker" for you to solve, and his amusing "Broom Handle Rhombic."

Bob, WB8JEN, for giving us directions for the construction of a "UHF-Gated Noise Source."

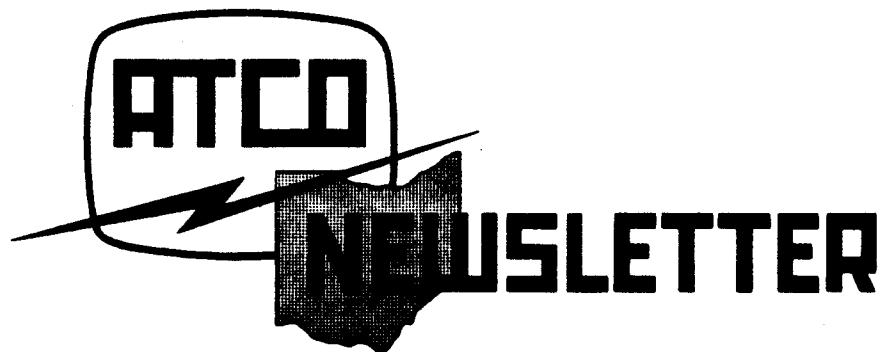
---WANT TO JOIN ATCO? CALL THE NEWSLETTER EDITOR FOR DETAILS.---

Editor: Warren, KA8GZQ

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Columbus, Ohio 43220
3488 Darbyshire Drive
c/o Warren G. Duemmel



14 PAGES IN THIS ISSUE!

BUILD A 25 ELEMENT 1.26 GHZ LOOP YAGI ATV ANTENNA.
FIND OUT HOW IN THE JULY ATCO NEWSLETTER!
